CLAIMS

What is claimed is:

1. A device for manipulating particles using dielectrophoresis, the device comprising:

a substrate;

an insulating ridge on the substrate;

a plurality of electrodes positioned to generate a spatially non-uniform electric field across the insulating ridge.

2. A device according to claim 1, further comprising a plurality of the insulating ridges.

2. A device according to claim 1, wherein the substrate comprises glass.

3. A device according to claim 1, wherein the substrate comprises a polymer.

4. A device according to claim 1, wherein the insulating ridges comprise an insulating material supported by a non-insulating material.

5. A device according to claim 1, further comprising a voltage source connected to the plurality of electrodes.

6. A device according to claim 1, wherein the plurality of ridges on the substrate define a surface of a first fluid channel.

7. A device according to claim 6, further comprising a fluid port connected to the first channel.

8. A device according to claim 6, further comprising a second fluid channel connected to the first fluid channel.

9. A device according to claim 1, wherein the plurality of ridges are each at an angle of between 20 and 80 degrees relative to a direction of fluid flow.

10. A device according to claim 1, wherein the plurality of ridges are each at an angle of about 45 degrees relative to a direction of fluid flow.

11. A device according to claim 1, wherein the plurality of ridges includes a first ridge and a second ridge, said first and second ridges being positioned at different angles relative to a direction of fluid flow.

12. A device according to claim 1, wherein at least one ridge of the plurality of ridges is curved toward a concentration area.

13. A device according to claim 1, wherein the plurality of ridges are curved toward a concentration area.

14. A device according to claim 9, further comprising:

a plurality of impedance matching ridges substantially parallel to the direction of fluid flow.

15. A device according to claim 12, further comprising:

a plurality of impedance matching ridges substantially parallel to a direction of fluid flow.

16. A device according to claim 1, wherein the spatially non-uniform electric field generated across the ridges exerts a dielectrophoretic force on at least one of said particles.

17. A device according to claim 16, wherein said particles comprise particles selected from the group of particles consisting of bacteria, cells, and viruses.

18. A method for manipulating particles using dielectrophoresis, the method comprising:

generating a spatially non-uniform electric field across an insulating ridge;

passing a sample fluid containing the particles across the insulating ridge, the spatially non-uniform electric field exerting a dielectrophoretic force on the particles thereby constraining motion of at least one particle; and

transporting at least the constrained particle along the ridge.

19. A method according to claim 18, wherein the act of transporting the particle comprises electrokinetic transport.

20. A method according to claim 18, wherein the act of transporting the particle comprises advection.

21. A method according to claim 18, wherein the act of transporting the particle comprises transporting particles using a gravitational force.

22. A method according to claim 18, wherein the act of contacting the insulating ridge with a sample fluid comprises flowing the sample fluid across the insulating ridge.

23. A method according to claim 22, wherein the insulating ridges are positioned at an angle with respect to the direction of fluid flow.

24. A method according to claim 18, further comprising transporting the particles to a concentration area.

25. A method according to claim 18, further comprising:

generating a spatially non-uniform electric field across a plurality of insulating ridges including a first ridge and a second ridge, thereby constraining motion of at least a first particle to a region adjacent the first ridge;

changing the spatially non-uniform electric field such that the dielectrophoretic force on the first particle is decreased; and

transporting the first particle to the second ridge.